

## *Linear Detector Setup*

**\*Before Beginning:** Make sure NIM-BIN with detector electronics is turned off and HV switch on the HV Power Supply is off.

### **I. Counting Gas System Setup:**

As Counting Gas, use a mixture of Ar with 10% CO<sub>2</sub>

1. Connect the counting gas cylinder to “Gas In” on the Counting Gas Controller. (See Diagram, Black line)
2. Connect gas lines “To” and “From” on Counting Gas Controller to the “In” and “Out” channels on the Linear Detector, respectively. (See Diagram, Purple lines)
3. Carefully open the gas cylinder valve.
4. Set the regulator to 55 psi.
5. Close the outlet metering valve on the Counting Gas Controller by turning completely clockwise.
6. Carefully open the “Gas In” valve and observe pressure gauge on controller.
7. If necessary, adjust the tank regulator so that the controller pressure gauge reads 55 psi.
8. Open the metering valve by approximately 3 turns counterclockwise.

#### ***\*Purging Procedure:***

9. Close the “Gas In” valve.
10. Let pressure decrease to approximately 5 psi.
11. When the pressure reaches 5 psi, open the “Gas In” valve and let pressure increase to 55 psi.
12. Repeat purging procedure (Steps 9, 10, and 11) 5 times.

#### ***\*Check Leak-tightness of Counting Gas System:***

13. With the “Gas In” valve open and counting gas pressure at 55 psi, close metering valve.
14. Observe flow rate on flow meter. Let the gas flow settle down (this could take as much as 5 min) and the flow meter should read less than 1.

15. Slowly open the metering valve to increase flow rate to 2 (or 1 to 2 bubbles per second on the bubbler).
16. This concludes the counting gas setup procedure.

## **II. Electronics Setup:**

1. Connect detector low voltage cable to low voltage power supply. (See Diagram, Red line)
2. Connect detector high voltage cable to “High Voltage A” of high voltage power supply (positive). (See Diagram, Yellow line)
3. Connect detector “Right” output cable to input of Right Zero Crossing Amplifier. (See Diagram, Blue line)
4. Connect detector “Left” output cable to input of Left Zero Crossing Amplifier. (See Diagram, Green line)
5. Connect ZC (zero crossing) output of Right Zero Crossing Amplifier to “Start” “In” of Time Amplitude Converter (TAC). (See Diagram, Red Dashed line)
6. Connect ZC (zero crossing) output of Left Zero Crossing Amplifier to “Delay T Input” of Stop-Start Delay Generator. (See Diagram, Brown line)
7. Connect output of Stop-Start Delay Generator to “Stop” “In” of Time Amplitude Converter (TAC). (See Diagram, Black Dashed line)
8. Connect “TAC Out” to input on ADC. (See Diagram, Pink line)
9. Connect detector “Anode” cable to “Norm Input” of Model 9615 Spectroscopy Amplifier. (See Diagram, Orange line)
10. Connect Unipolar Output of Model 9615 Spectroscopy Amplifier to a channel “In” of the Single Channel Analyzer (SCA). (See Diagram, Yellow Dashed line)
11. Connect Channel 1 “Out” of Single Channel Analyzer (SCA) to input of NIM? TTL Converter. Be sure to use the *top* half of the channels (for NIM? TTL conversion). (See Setup Diagram, Orange Dashed line)
12. Connect NIM? TTL converter output to inputs of VME Scalar. (See Setup Diagram, Green Dashed line)

### III. Set/Check Gain of Anode Counting Chain:

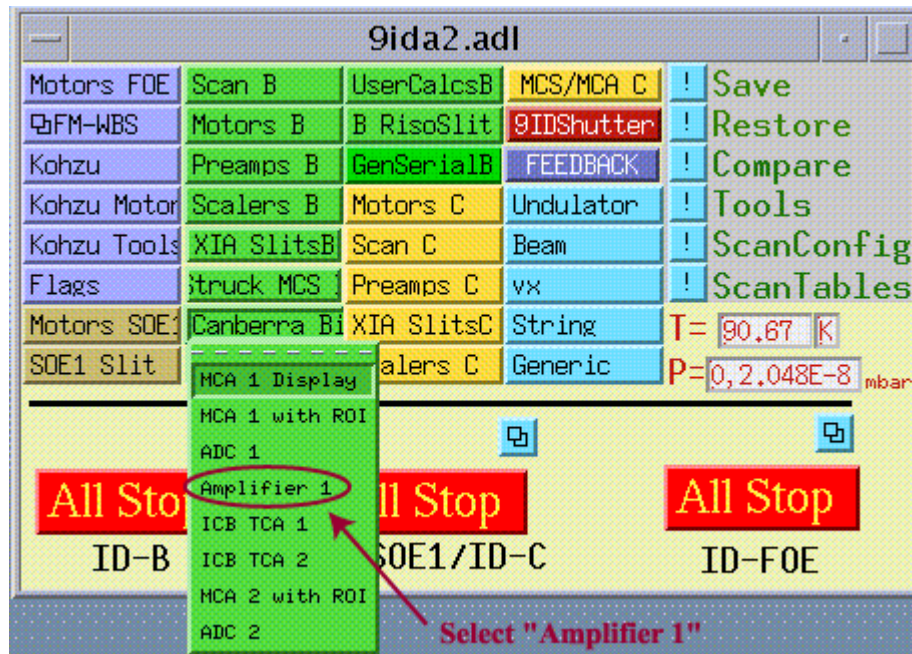
The purpose of this procedure is to set/check the gain of the Anode Amplifier (Model 9615 Spectroscopy Amplifier) so that a -75 mV input signal at the Detector “Anode” “Test” input results in a 1 V signal at the Unipolar Output of the Spectroscopy Amplifier

#### Setup of the Tail Pulse Generator:

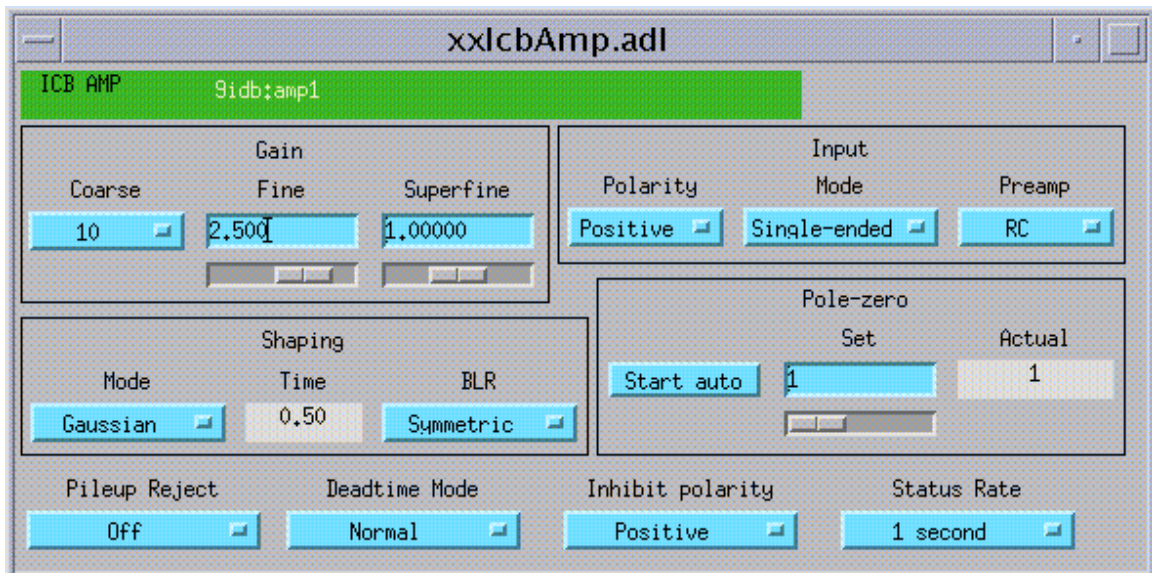
**CAUTION!** Make sure the Tail Pulse Generator is set correctly to yield a **-75 mV** signal before connecting it to the “Anode” “Test” input of the linear detector. **TOO LARGE A SIGNAL CAN KILL THE DETECTOR PREAMPLIFIER!**

1. Set the BNC Tail Pulse Generator to  
FREQUENCY: 1 kHz  
SING PULSE  
DELAY: 0.1  $\mu$ s  
REF: INT  
POL: “-“  
RISE TIME: 0.05  $\mu$ s  
FALL TIME: 10  $\mu$ s  
AMPLITUDE: 7.5  
ATTENUATOR: X10 OFF, **X100 ON** (switch up)
2. With Counting Gas System operational, turn-on detector NIM-BIN  
(Do not turn on High Voltage yet)
3. Connect Tail Pulse Generator “PULSE OUT” to Detector “Anode” “Test”
4. Connect Unipolar Output of the Model 9615 Spectroscopy Amplifier to the Oscilloscope
5. Set Oscilloscope for 1  $\mu$ s of horizontal deflection, 500 mV of vertical deflection.

6. In main Epics menu, open [**Canberra B**] > [**Amplifier 1**]. (See picture below)



7. Setup Amplifier parameters according to the picture below:



8. Observing the output signal on the oscilloscope, adjust amplifier gain so that the signal amplitude is 1 V  
(Note: Total Gain = Coarse x Fine x Superfine)

#### IV. Turn-on Detector High-Voltage:

**CAUTION!** Familiarize yourself with the operation of the Bertan HV Power supply. An excessive high-voltage can easily damage the detector

1. Ascertain that the Counting Gas System is operational and that the detector NIM-BIN is turned-on
2. Ascertain that the “HV” switch on the Bertan HV Power supply is set to “off” and that the “POS” potentiometer is at 0.0 (all the way ccw)
3. Set left “TRIP AT 80%...” -switch to 1  $\mu$ A
4. Flip left “HV” switch to “ON”. If associated LED does not light, flip adjacent switch from “TRIP HOLD” to “AUTO RESET” and back to “TRIP HOLD”. The HV LED should now be on.
5. While observing the current meter, slowly increase the HV to **2420 V** by turning the potentiometer cw (1 turn corresponds to 1000 V). In this process the current peaks should not exceed 1/3 of full range of the meter.
6. Once the final high-voltage is reached and the current appears to be stable, switch the left “TRIP AT 80%...” -switch to 0.1  $\mu$ A